



## Engineering Sciences Section – 2007

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### C16 Uncertainty in Plume Delineation

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After attending this presentation, attendees will have an increased understanding of the uncertainty associated with plume delineation, error bands associated with concentration contours and volume calculations.

This presentation will impact the forensic community and/or humanity by increasing awareness of the limits of computer generated contours.

Delineation of plumes from observations is a widespread activity in the analysis of contamination. The shape and extent of the plume is almost always presented as a single representation. This paper discusses the uncertainty involved in the plume depiction. In particular, the paper investigates the uncertainty resulting from data uncertainty and the extremes of the plume.

Depiction of a two or three dimensional plume is typically based on an interpretation of a set of point data. This process involves the interpolation and extrapolation of the point data. Some of the interpolation methods such as kriging contain error estimates that can be used to bound the interpolated values. Using these error estimates the uncertainty in the plume predictions can be evaluated.

The point data from which the plume is derived also has an associated uncertainty, but this is rarely considered. The paper describes a technique by which a rigorous uncertainty analysis can be used to evaluate the uncertainty resulting from the data can be evaluated.

The paper demonstrates the relative contributions of the two types of uncertainty as applied to a two dimensional plume.

#### **Contamination, Extent, Uncertainty**